MULTI-POINT TOUCH PAD

BACKGROUND OF THE INVENTION

[0001] The invention relates generally to touch pads and more particularly to a multi-point touch pad data input device.

[0002] Presently, touch pads are used in a variety of applications and in various devices. They are used on computers to control the pointing device as well as videogame controllers and security system keypads, to name a few. Conventional touch pads are generally only capable of registering one touch at a time, and generally, are incapable of registering a touch unless the touch is in a specific location on the touch pad. Generally, touch pads used with computer equipment will register an initial location where the finger touches the pad, and subsequent finger movement will be related to that initial point. Furthermore, certain computer touch pads generally may contain two special places where applied pressure corresponds to clicking a left or right mouse button. Other computer touch pads sense single taps or double taps of the finger at any point on the touch pad as corresponding to clicking a left or right mouse button. Thus, the single point touch pad is mainly used as a pointing device with a computer or with a device that only registers one specifically located touch such as a keypad.

[0003] New technologies including video game systems, computers, as well as devices incorporating electronic music require the need for multi-point touch pad technology. A multi-point touch pad can detect multiple touch points simultaneously on a single touch pad. Currently, multi-point touch pad technologies include the use of fiber-optic based pressure sensing, Force Sensing Resistors™ (FSR), piezoelectric sensors and capacitive touch sensors. The aforementioned technologies allow touch pads to register multiple touches. However, specifically in the case of force sensing resistors, piezoelectric sensors and capacitive touch sensors, a touch on the touch pad will not be detected unless the sensor on the touch pad is touched directly. Consequently, if the space between sensors is touched, a touch will not be properly detected or registered.

[0004] Another desirous feature of multi-point touch pads is the ability to measure pressure as well as multiple point touches. FSRs, piezoelectric sensors and capacitive touch sensors are other types of sensors that can respond to pressure. However, they suffer the same problem as previously mentioned in measuring pressure, namely, if not touched directly, there is little response, an inaccurate response or no response from the sensors.

[0005] Thus, the aforementioned touch pads are of limited use to a user seeking to control various types of devices with precision and accuracy. Accordingly, there is a need for a multi-point touch pad that ensures that simultaneous, multiple touches may be accurately and precisely sensed and recorded. There is also a desire that multi-point touch pads can accurately and precisely sense and record the pressure that is placed by the touch.

SUMMARY OF THE INVENTION

[0006] The present invention is directed to a multi-point touch pad device using strain gauges or comparable measurement devices for measuring location and touch pressure that ensure an accurate and precise touch on the touch pad. A multi-point touch pad device in accordance with a preferred embodiment of the invention can be made capable of sensing simultaneous, multiple touches as well as accurately and precisely recording the amount of pressure registered by each touch. Various output signals from the touch pad can be compiled and calculated into a set of locations and pressures associated with touch points with the assistance of a specifically written and designed mathematical algorithm which can be programmed into a Digital Signal Processor (DSP).

[0007] A touch pad in accordance with a preferred embodiment of the invention can include a touch surface. A plurality of pressure sensors such as strain gauges are arranged under and coupled to the touch surface. As a user touches the surface at multiple points, the pressure sensors send pressure reading signals to a processor which uses those readings to calculate touch locations and preferably also touch pressure. The processor can then send control signals to control the operation of a device.

[0008] Other objects and features of the present invention will become apparent from the following detailed description, considered in conjunction with the accompanying drawing figures. It is to be understood, however, that the drawings are designed solely for the purpose of illustration and not as a definition of the limits of the invention.

BRIEF DESCRIPTION OF THE DRAWINGS

[0009] In the drawing figures, which are merely illustrative, and wherein like reference numerals depict like elements throughout the several views:

[0010] **FIG. 1** is a perspective top-view of the multi-point touch pad in accordance with a preferred embodiment of the invention;

[0011] **FIG. 2** is a top-plan view of the multi-point touch pad of **FIG. 1**;

[0012] **FIG. 3** is a cross-section view taken along line **3-3** of the multi-point touch pad of **FIG. 2**; and

[0013] **FIG. 4** is a flow diagram of an exemplary process of content augmentation in accordance with a preferred embodiment of the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0014] The present invention is directed to a multi-point touch pad device having a touch surface with a top surface that defines a plane, and also having a base with a surface defining a plane. At least one wall extends generally perpendicular to and away from the plane at the edge of the base. The base and at least one wall form a touch pad enclosure. A support layer made of a soft, resilient material is preferably disposed under the touch surface. The top of the support layer contains a plurality of pressure reading devices such as strain gauges that can be adhesively bonded or otherwise coupled to the top surface of the support layer, preferably in a matrix configuration. A touch layer which can be formed of a thin, film-like material is preferably disposed on top of the strain gauge matrix. The touch layer is preferably adhesively bonded or otherwise joined to the top of the strain gauge matrix. The strain gauge matrix can therefore be disposed between the support layer and the touch layer.